UNIVERSITY OF TORONTO
MEDICAL JOURNAL

Comments on the Treatment of Acne Vulgaris	Basil Bowman, M.D., C.M.	164
Psoriasis	Jacob Kraicer, B.A., 5T8	168
Warts	J. H. Ben, 5T8	174
Tranquillizers—A Progress Report: Part II	J. B. Houpt, 5T8	176
Management of Severe Thermal Burns	P. G. Walfish, 5T8	179
Pleural Effusion	M. H. Rotterman, 5T8	187
Obstetrical Anaesthesia and Analgesia	G. G. Forstner, 5T8	191

MARCH 1958

VOLUME XXXV NUMBER 5

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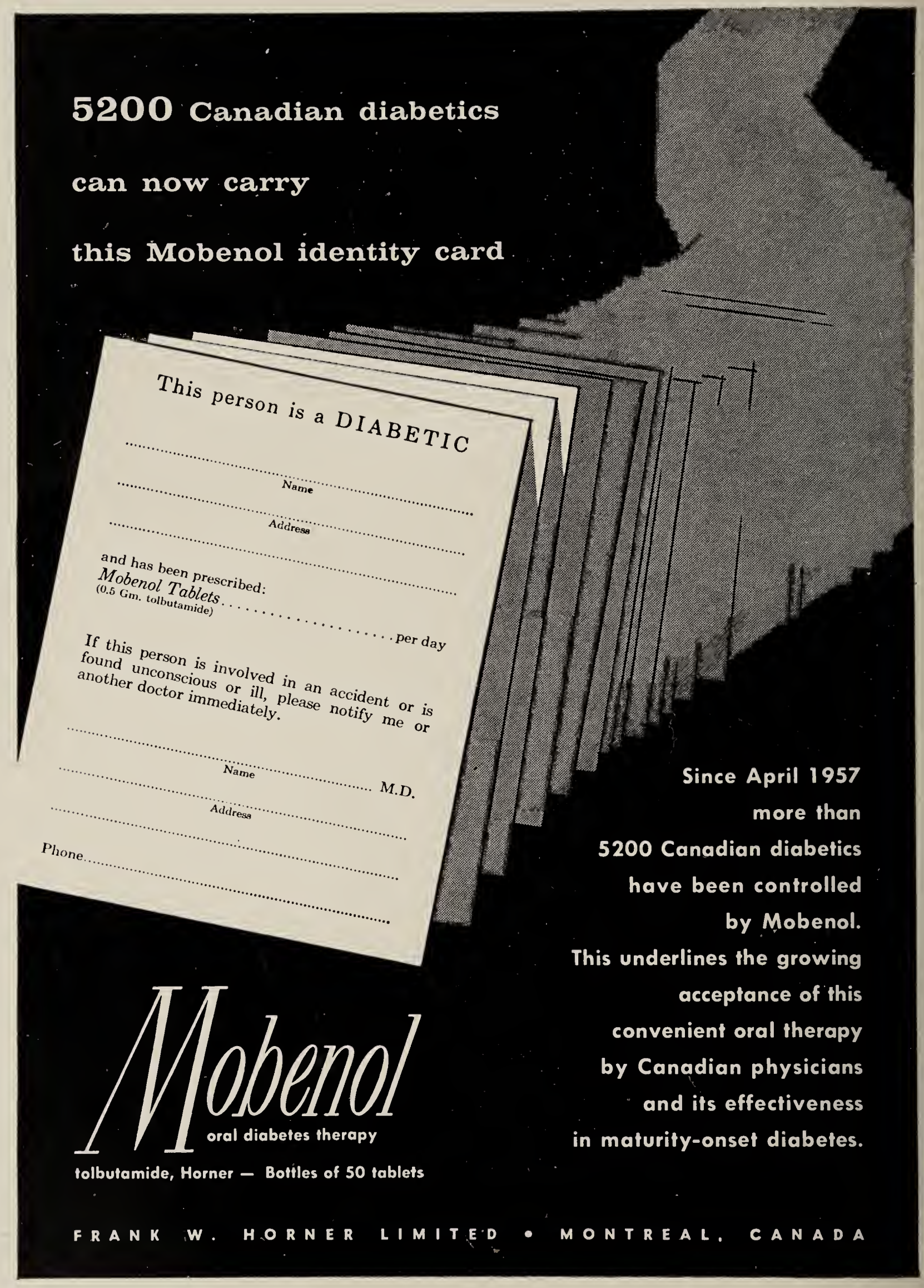

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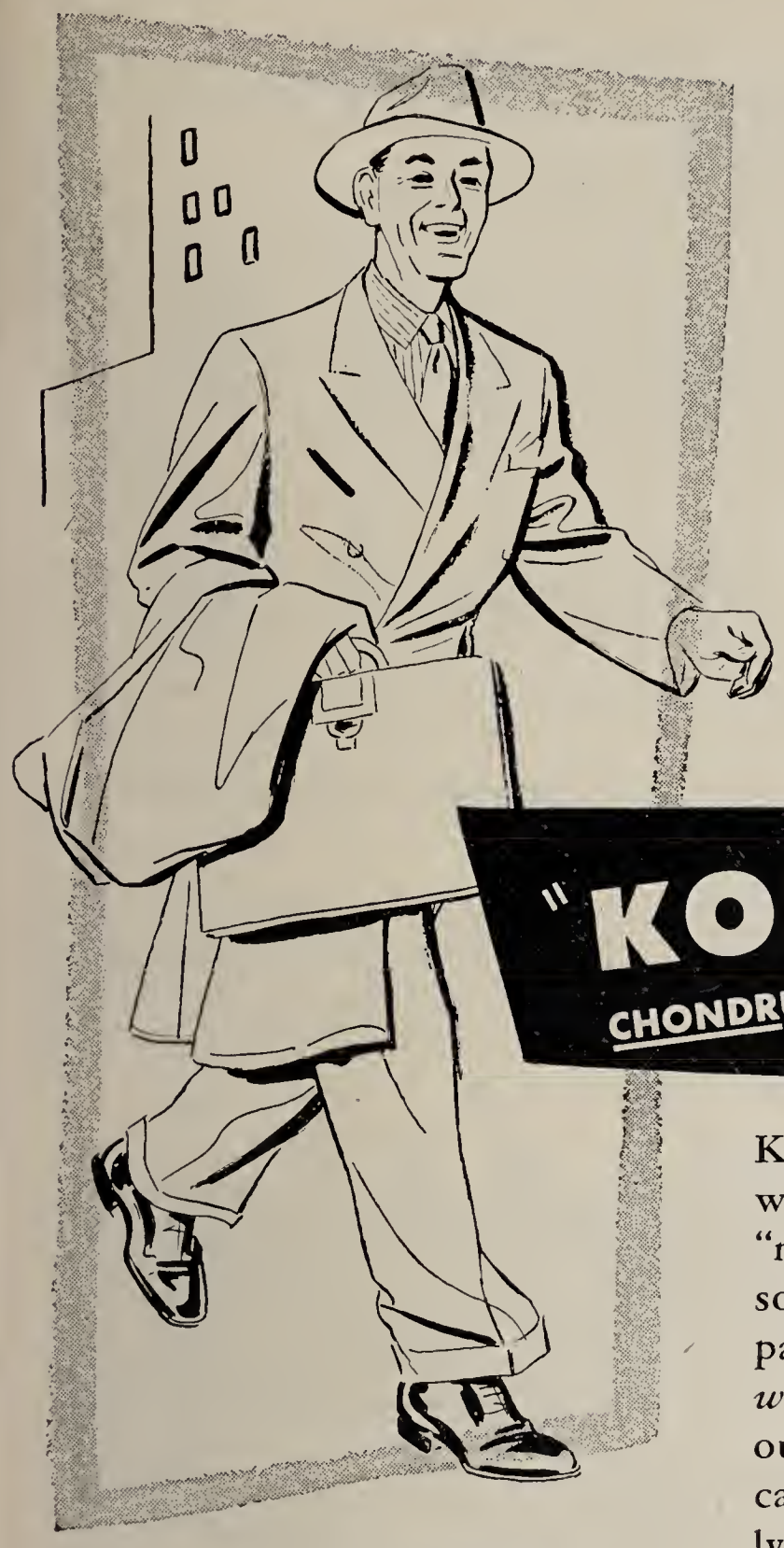

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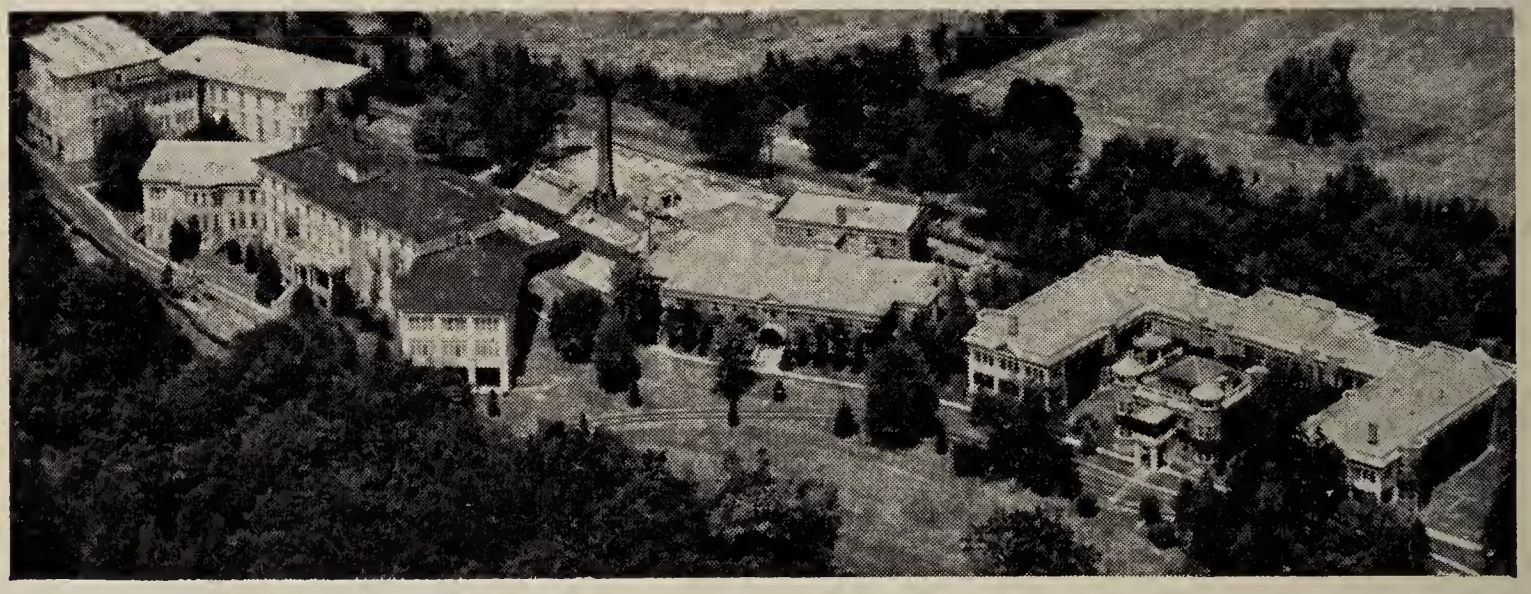

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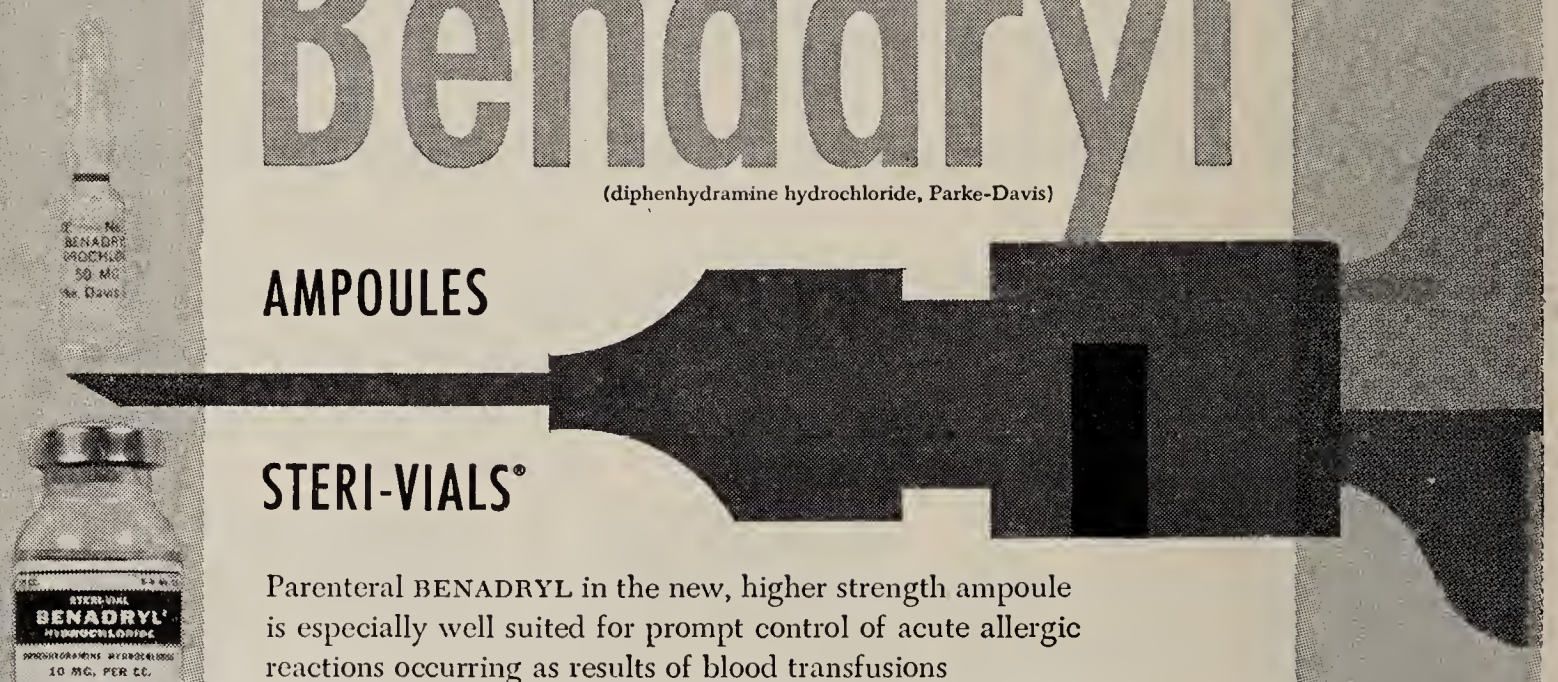

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COMMENTS ON THE TREATMENT OF ACNE VULGARIS

BASIL BOWMAN, M.D., C.M.

IN this discussion there is no necessity to dwell on the diagnosis of Acne Vulgaris. If one sees comedones, papules, pustules, and pitted scars on the face, chest, or back, with a skin that has a tendency to be oily, in a person, male or female, at any age, it is Acne Vulgaris.

As to its etiology, we know that it is some derangement of the sebaceous glands, which secrete either excessively or abnormally, leading to plugging of the follicles, along with a superimposed infection, which results in the formation of papules, pustules, and abscesses.

We know that it usually begins at, or around, the age of puberty, in both sexes, at which time there is a change in the activity of the glands of internal secretion, which in turn may control the activity of the sebaceous glands. We also know that, particularly in girls, there is usually an exacerbation just before or during menstruation, which would lead us to assume that the glands producing estrogenic hormone may act as the controlling influence. We assume this, but I don't think that it has been definitely proved, because we know also that all of the glands of internal secretion are linked up in a chain reaction, so that it may eventually be shown that it is one of the other glands, or a combination of these, influenced by the estrogen-producing ones, that really control the sebaceous glands. Nothing has as yet been proved in regard to this.

Regardless of these conjectures, we do know that Acne Vulgaris is one of the commonest and most important conditions with which a Dermatologist has to deal, and I would assume that it would also be seen very frequently in General Practice.

In making comments on the treatment of Acne, let us first decide whether it should be treated or not. It is really amazing, in these modern, enlightened days of Medicine, to see the number of patients who have been told by reputable Physicians that nothing should be done, that it is a condition which occurs at the age of puberty, that they will have it for two or three years, and that they will grow out of it and be quite alright. Is this true or false? It usually does occur around the age of puberty, and some may grow out of it, but I have seen many who still have active Acne in their forties and fifties. Every papule and every pustule of Acne involves the deeper layers of the skin, and when these heal, they always leave a pitted scar, and so, regardless of how long Acne lasts there will be more or less resultant scars. Does it not seem logical, then, that Acne should be treated as soon as possible, so that there will have been fewer papules and pustules, and therefore fewer resulting scars? Beginning at or around puberty as it does, Acne occurs at a time when young individuals are probably at the most psychologically sensitive period of their lives, the time when they can first be persuaded to comb their hair, wash their face, and take an interest in themselves, and more particularly, it is at the time when there is an awakening interest in the opposite sex. I have seen many who are in such a state of depression about their appearance that they do not wish to appear in public, will not go to parties, and will shy away from the opposite sex, all of which is an abnormal psychological attitude. If, by treatment, this attitude can be improved, and it is amazing how much it is improved after a very few weeks of treatment, and also, if by treatment, the resulting scars from

Presented at the O.M.A. Convention, Toronto, June 1957.

lesions can be minimized, then I feel very strongly that treatment is indicated. I feel so strongly on this subject that I will go so far as to say that anyone who advises otherwise is guilty of criminal negligence in their practice.

The rationale of the treatment of Acne should have one primary object in view, the reduction, permanently if possible, of the activity of the sebaceous glands in the affected areas, and secondarily, treatment of the infected lesions.

I would like to comment on the types of treatment used today for this condition, some of which I approve, and others I will only mention to condemn.

The extraction of comedones or blackheads is still advised by many, and patients are often instructed to do it themselves, either by squeezing or by the use of a comedone extractor, a small metal instrument with a hole in the centre, the technique being to place the hole over the comedone, push, and the comedone will pop out. This treatment is not advised to any great extent at the present time, as we find that with the general improvement of the Acne under proper management that the comedones will automatically disappear. As to squeezing either the comedones or any papules or pustules, it is to be condemned. It seems to be a natural tendency on the part of most people to squeeze any spot of any kind, on the skin, which tends to break down any wall of resistance around the lesion, usually leading to an exacerbation. Patients should be instructed to leave any lesion strictly alone, and to make a conscious effort to keep their hands away from their face.

It is interesting to note the number of patients who have been advised to apply Calamine Lotion to the affected parts. This is a mixture of Zinc Oxide and Zinc Oxide with 2% Iron Oxide in water, both inert substances which, when the water evaporates, leave a powder on the skin. However, if there should be any exudate, it forms a very hard plaster. It is a soothing application, to be used on a dry, inflamed skin which itches. It acts as an anti-pruritic when the proper agents, such as Phenol or Menthol are added to the mixture, but I can see no advantage to its use in Acne; I would say, rather, that it is contraindicated.

Many patients whom I have seen have been given some preparation of Tin for lengthy periods, particularly if they have any pustular lesions. As I remember the history of the use of Tin, it was noticed some years ago that Tin miners did not seem to be subject to boils, and so it was reasoned that Tin should be given for the treatment of boils. I have not found the use of Tin to be of any value in the treatment of Acne. It does not help the pustular lesions, and it certainly has no effect on the underlying glandular disturbance.

Penicillin and some of the other antibiotics have been and still are used by some, presumably on the assumption that it may help the infected lesions. I do not feel that the antibiotics are indicated in this condition, particularly in view of their sensitizing side reactions.

Patients are still seen who have been put through lengthy courses of injections of vaccines, both autogenous and stock, and also Toxoid, and in most instances, these have been found to have little value.

In the past few years, the results of estrogen hormone therapy have been repeatedly reported, with such good results in many cases that some Dermatologists have used it exclusively. However, the results were slow in appearing, usually taking from one year to eighteen months. At first it was used only in the female, but later in the male also. I have used this type of therapy for the past two years, but have given it up for three reasons. I did not find

that the results were any better than with standard Dermatological therapy, if as good, and it took much longer to get that result. In the female, it almost invariably so upset the menstrual cycle, that the patient did not wish to continue. In the male, it very often caused enlargement of the breasts, with the result that the therapy had to be discontinued.

An article by Baird, in the March number of the British Journal of Dermatology, points out that the use of high dosage of antigen-antibody preparations, along with stimulation therapy by gonadotrophic hormone has given excellent results. I have had no experience with this combined therapy, but it would seem logical in view of the fact that there is probably an imbalance of hormonal substance, plus a superimposed infection.

Baird's technique is as follows: In the male, 500 international units of chorionic gonadotrophic hormone are given intramuscularly, once weekly. In the female, 500 international units are given one week and three weeks after the first day of menstruation, and 1,000 units two weeks after the first day of menstruation. Along with this, Serobacterin is given subcutaneously, at weekly intervals, in graduated doses ranging from 0.2 cc. up to 3.5 cc.

Baird states that "this is a stimulation therapy with gonadotrophic hormone rather than a substitution therapy. Not only has it not produced disturbances of glandular function but it seems to have corrected imbalances not related to Acne, such as painful menstruation. The antigen-antibody preparation is used in very large doses to increase resistance against infection. Neither the hormone therapy nor the vaccine therapy are of great value in Acne Vulgaris when used alone. It is their use at the same time which is recommended."

Dietary restrictions are rather important, particularly as regards carbohydrates, as an adjunct, in therapy, but dietary restrictions by themselves will not cure Acne. However, excessive intake of carbohydrates will cause an exacerbation of the condition. Sometimes even one chocolate candy will cause Acne to flare.

Most patients, when first seen, will volunteer the information that they have been placed on a diet low in fat, and that they should not eat foods cooked in fat. I can see no rational reason for this. We know that patients with Acne have a tendency towards an oily skin, but it does not follow that because a certain fat is taken into the gastro-intestinal tract, it is absorbed as such, and deposited in the skin. Therefore, it is not felt that normal fat intake should be curtailed.

With the exception of carbohydrate restriction, and the possible benefits to be expected from the use of the combined hormone-vaccine therapy, I know of no other internal medication that is of any value.

Most patients, when first seen, will state that they have used ointments of various kinds on their skin, sometimes for long periods of time, but that they have not noticed any improvement from their use. In view of the fact that most patients with Acne have an oily skin, and that all ointments have a greasy base, it would seem that it is only adding insult to injury to use any ointment, and they are definitely contra-indicated. The same can be said for the use of cosmetic creams in those with Acne.

External therapy, however, is of great value. The application of some form of sulphur has been a standard form of treatment for many years, an example of this being Lotio Alba, which is a mixture of Zinc Sulphate and Potassium Sulphuret. This is a white mixture, and is not cosmetically acceptable, so im-

provements have been made by tinting the mixtures, with the result that we have such preparations as Acnomel, Acnomel Cake, which is half the strength of Acnomel, for use on the female skin, and also Clearasil. The action of all of these is the same, namely, mildly antiseptic, astringent, drying, and in some cases, peeling. They have a temporary beneficial effect.

The liberal use of soap and water is also beneficial, not only for its cleansing effect, but also for its drying action. Soap is a fat solvent, and therefore removes the excessive oil, resulting in a drier skin.

It has been known for many years that the majority of patients with Acne improve greatly in the summer, when they are exposed to sunlight. In the autumn and winter, with less exposure the lesions of Acne recur. Ultra-violet light, produced either by carbon arc or mercury vapour, will, in many instances, give the same beneficial result as natural sunlight, but as soon as treatment is discontinued, there will be a recurrence. It is therefore only a temporary beneficial measure.

At the risk of being considered old fashioned, superficial X-ray therapy still gives the quickest and most permanent result in the treatment of Acne. In well-trained hands, and with a properly calibrated machine, the dangers of X-ray sequelae are minimal. A great deal has been written in the Press and in magazine articles during the past year regarding the dangers of X-ray overexposure or overdosage. But this can be said for almost anything, drugs, food, drink, and even exercise. In the case of X-ray, where the machine is the charge of an untrained operator, and the output is unknown, as in the case of shoe fitting, it can be dangerous, but when in the hands of well-trained personnel, who know the exact output of their machine, and also the limit of tolerance of the skin, it is considered that X-ray therapy is safe and good in the treatment of Acne.

The use of Grenz ray has been advocated by some on the assumption that there are no sequelae from its use. Grenz ray is long wave X-ray, and provided that enough is given, sequelae can occur. Its use has not been adopted by many.

In all cases who have recovered from Acne, there are resultant pitted scars of various sizes and depth. Provided there is no activity, the operation of surgical planing to remove the scars may be recommended. This is not a treatment for Acne, but only for the scars remaining after the Acne lesions have healed. It should be stressed that the operator must be expert in the use of the technique, the patients should be very carefully selected, and they should be warned not to expect a perfect result, but that they must be satisfied with improvement of variable degrees in the appearance of their skin. In any patient who has a tendency to form keloids, this type of treatment is contraindicated. However, this rarely occurs, and so the results of surgical planing can be said to be moderately good.

In conclusion, the best, quickest and most permanent results may be obtained from the following regimen:–

1. Restriction of carbohydrates in the diet, particularly pie, cake, pastry, candy, ice cream, and most soft drinks.

2. The use of a sulphur-containing preparation externally, such as Acnomel or Acnomel Cake, to be applied at night, and washed off with soap and water in the morning.

3. The use of superficial X-ray therapy if done by one trained in Dermatological therapy.

4. If this is not available, the use of the Baird combined hormone-antigen-antibody therapy.

PSORIASIS

JACOB KRAICER, B.A., 5T8

PSORIASIS is a chronic recurrent erythemato-papulo-squamous dermatosis of unknown etiology characterized by sharply defined reddish brown plaques of varying size covered by silvery white scales.

Etiology

The etiology of psoriasis is unknown. The number of theories concerning etiology is boundless, due in part to a noticeable lack of fundamental research into etiological factors. "Here is an example of the relative neglect into which the support of basic applied investigations of dermatological disorders has fallen."

The following factors have been considered as causal agents:

1. Vitamin deficiencies
2. Metabolic factors, especially disturbed lipid metabolism
3. Endocrine disturbances
4. Cerebral corticosomatic depression resulting from various trigger mechanisms causing a decreased cellular oxidation
5. Idiosyncrasy to drugs
6. Infection
7. Constitutional factors, i.e. the expression of the disturbed adjustment and adaptation between the patient and his environment
8. Depletion of calcium in protein metabolism
9. Defect in vitamin D metabolism

Psoriasis accounts for 5% of all skin diseases. Its incidence in the population is 0.2–0.3%. Men and women are equally affected. The peak age incidence lies between 15 and 30 (uncommon under 5 and over 60). The disease tends to become less troublesome with increasing age and during pregnancy. The incidence of family history has been reported all the way from 0.5 to 50%, with an average of 20%. Predisposing factors include minor trauma, exposure to sun, acute infection and psychic trauma.

Histopathology

In the typical case, the microscopic findings are diagnostic. The epidermis shows:

1. hyperkeratosis.
2. uniform parakeratosis.
3. absence of the granular layer.
4. regular acanthosis with slight intercellular oedema of the prickle cells.
5. thinning of the supra-papillary portion of the epidermis.
6. groups of migratory polymorphonuclear leukocytes in the stratum corneum (pseudoabscesses of Munro).

The dermis shows:

1. capillary dilatation and oedema.
2. uniform regular elongations of the dermal papillae with thinning of the supra-papillary portion of the epidermis, resulting in capillaries being close to the surface.
3. perivascular infiltration with lymphocytes, polymorphs, fibroblasts, and the migration of polymorphs up into the epidermis.

Clinical Aspects

The primary lesion is a pin-head sized erythematous, dry, round or oval, sharply circumscribed papule covered by a delicate silvery mica-like scale. Plaques are formed by an increase in the size of the papules and by the coalescence of papules. The plaques are dry, flat, slightly elevated, non-indurated, somewhat infiltrated and covered by scales. The

scales are loosely adherent, imbricated, dry, thin, slightly translucent, and glistening white. The transition between normal and involved skin is abrupt. The amount of scaling is variable. It is only slight in the acute form, in intertriginous areas, after frequent bathing, after medication and in an area exposed to friction. Conversely, scaling is increased with excessive dryness, poor hygiene, in chronic cases and in the aged. As a rule, the scales are disposed over the entire patch, extending slightly beyond the margin. Removal of the scale by gentle scraping reveals numerous minute bleeding points which correspond to the apices of the dermal papillae (Auspitz sign). This is not, however, pathognomonic of psoriasis.

The lesions vary greatly in number, size, shape and distribution, but the morphology remains essentially similar so that in the uncomplicated case, psoriasis forms distinctive easily recognized lesions. Except in the acute form, pruritus is usually slight or absent, but is occasionally troublesome with a marked predilection for the scalp, elbows, knees and lower part of the back.

The lesions are usually symmetrical and may be generalized. The sites of preference are the extensor surfaces of the extremities, especially about the elbows and knees, the scalp and sacral region. Less commonly affected are the nails, upper surface of the chest, face, abdomen and external genitalia. Lesions are rarely found on the hands, feet and intertriginous areas. The disease usually remains limited to two or three small plaques situated over the knees or elbows. Occasionally a single lesion may appear and remain indefinitely without the appearance of others. In the same individual, the number, size and distribution of the patches differ from time to time. During recurrences, the site of the new lesions does not necessarily correspond to that of a previous attack.

Involution of a patch begins in the centre and progresses slowly until no sign of the lesion remains. Temporary pigmentation may remain for a time after the scaling and infiltration have disappeared. Very rarely, superficial scars, keloid formation, deep pigmentation or achromia may remain permanently.

A number of descriptive terms are used to characterize the predominant morphology:

punctate—pin-head papule
nummular or discoid—coin shaped plaques
guttate—drop-sized plaques
geographic or gyrate—wavy or spreading edge
circinate—annular or ring forms
rupioid—thickened lesions with large conical crusts
linear—band-like lesions
inverse—flexural and intertriginous areas favoured

During the active phase of the disease, the skin reacts to physical or chemical trauma or irritation by the formation of psoriatic lesions at the site of trauma. This is the Koebner phenomenon. This probably explains certain patterns of localization such as the elbows or knees, which are subject to constant mild irritation. The occasional "seborrheic" distribution may be evidence of a Koebner phenomenon due to pre-existing seborrheic dermatitis or intertriginous maceration.

SCALP

The thick white mortar-like scaling of scalp lesions may become particularly heavy and difficult to remove. The individual plaques usually remain well marginated and edged with erythema unless the whole sclap is involved. The lesions affect the hairy parts, avoiding bald areas. Psoriasis never causes alopecia.

NAILS

The nails are involved in 20% of psoriatics. These present with pitting resulting from local punctate injury to the germinal epithelium of the matrix and/or transverse ridging and furrows and/or yellowish opacities in the nail substance and/or yellow friable subungual hyperkeratosis. The fingernails are affected more often than the toenails. The nail changes are particularly severe if there is associated arthritic involvement of the terminal interphalangeal joints. Nail involvement is usually bilateral. The differential diagnosis includes tinea unguium, poor blood supply, monilial infection and onychogryphosis.

ACUTE FORM

An acute episode may be the first manifestation of psoriasis or may complicate the chronic form. Multiple pruritic or burning papular lesions develop quickly and involve widespread sites symmetrically. There is marked inflammation, bright erythema, absence or only a trace of scaling and less sharply defined margins. The acute form generally terminates as the chronic form after a variable period of weeks or months, but may disappear completely. A dreaded complication is generalized exfoliative dermatitis which is thought to be due to an inherent predisposition and/or the use of excessively irritant drugs.

UNUSUAL FORMS

1. *Seborrheic Type*

Lesions may waver between patterns which are distinctly those of seborrheic dermatitis, with occasional replacement by lesions which are similar to those of psoriasis both clinically and histologically. This type is more resistant to therapy.

2. *Pustular Type*

Rarely, pustulation and crusting may appear in old patches of psoriasis or pustular psoriasis (of Barber) of the palms and soles may be the only manifestation of the disease. The pustules are formed by the coalescence of sterile microscopic Munro abscesses into macroabscesses in the stratum corneum. The pustules eventually dry up forming brownish crusts. Pustulation may develop in the course of a typical psoriatic lesion and only in certain plaques, or it may be an essential part of the disease from the onset.

3. *Inveterate Type*

In 1% of cases, the lesions are chronic, persistent, deeply infiltrated, often fissured, covered with heavy scales and refractory to treatment.

4. *Arthropathic Type*

A group of psoriatics present with various forms of arthritis. There is lack of agreement as to whether there is a type of arthritis specifically related to psoriasis, i.e. whether there is a psoriatic arthritis which is a distinct and separate entity. The general consensus is that there is a distinct psoriatic arthritis occurring in 3% of psoriatics. This is a rheumatoid-like arthritis involving the terminal interphalangeal joints with nail rather than skin involvement. The X-ray picture shows erosion of the tips of the terminal phalanges and marked erosion of the terminal interphalangeal joints. Others describe psoriatic arthritis as an entity associated with pustular psoriasis, the arthritis being indistinguishable from rheumatoid arthritis, and affecting the terminal joints of the fingers and toes with no characteristic X-ray changes.

DIFFERENTIAL DIAGNOSIS

In dry squamous *eczema* there is a lack of sharp definition of the patches, adherence of scales, absence of bleeding points, a history of contact or atopy, previous vesiculation or weeping, multiplicity in the morphology of the lesions, a greater intensity of subjective sensation and frequent involvement of the face.

In *seborrheic dermatitis* the lesions are orange-brown, smaller, greasy and have less abundant scales. The surface beneath is moist and scaly. The lesions are most numerous on the scalp, over the sternum, between the scapulae, over the eyebrows and behind the ears, and are rarely found on the elbows and knees. The lesions usually start on the scalp where there is a more diffuse involvement, and spread downwards behind the ears. The nails are never involved and the margins of the lesions are not sharply defined.

In *secondary syphilis* there is usually a history of primary chancre, evidence of mucous patches, and positive serological tests. The lesions are less symmetrical, more elevated at the edge, and covered by a few dirty yellow scales which are likely to form a collarette about the margin of the lesion. The base is indurated. The circular outline is often abruptly broken by gaps, thus producing semilunar and small arc-shaped segments.

In *pityriasis rosea* the papulosquamous eruption is preceded 7 to 14 days by the herald patch. The lesions are most commonly found on the trunk, almost never on the face and scalp. The papules are dry, oval, with their long axis following the lines of cleavage and they have fine scales with central clearing. The patches are usually salmon coloured. Involution occurs spontaneously in approximately six weeks.

In *lichen planus* the papules are flat-topped, minute, diamond-shaped, violaceous, located on the flexural surfaces and on the buccal mucosa. The scales are fine, scant and difficult to remove. The surface of the larger papules may be covered by white striae. Itching is usually severe.

Treatment

The patient must be made aware of the chronicity of the disease, that no cure is known, but that rigorous, thorough and prolonged treatment will remove the lesions for varying periods of time.

An extremely wide assortment of drugs, chemicals and endocrine products has been tried. The routines in use vary tremendously. Contradictions as to what constitutes preferred treatment are rampant. What may be considered as the most valuable drug by one, is considered useless by another. Accessible endocrine glands have been irradiated, vitamins have been used in massive doses, sex hormones and placental extracts have been advocated. The following rules of treatment are universally accepted:

1. Do not treat minimal lesions unless there is evidence of extension or the lesions become increasingly troublesome.
2. Each topical method gradually becomes ineffective. Thus, too vigorous a therapeutic attack may exhaust the arsenal leaving no reserve of therapy for the future.
3. The avoidance of trauma hastens involution and tends to hold back exacerbations.
4. A method which is successful in a given case may fail in another patient or in further exacerbations in the same individual.
5. Involution under treatment is usually slow. Any method of treatment should be given a fair and thorough trial.
6. Remissions often occur spontaneously.
7. The avoidance of alcohol is advisable.
8. Focal sepsis should be eradicated (teeth, tonsils, sinuses, etc.).

A. systemic therapy

There is increasing evidence that the various systemic approaches are of little or no value. Some of the most popular methods still in use are mentioned below. Various strict diets have been advocated, but there is no known basis

for their use. Some advocate low fat diets. Some suggest that large doses of vitamins A and/or D are useful. Arsenic in the form of Fowler's solution has long been advocated but should not be used, as it is effective only in a small number of cases, and there is a real danger of cumulative action with possible arsenical melanosis or epitheliomatosis. Systemic cortisone or ACTH have no place in treatment except possibly in psoriatic arthritis. While complete remission may occur, there is a prompt relapse when the steroid is stopped, the lesions frequently becoming more widespread and refractory to treatment. Triple typhoid vaccine is sometimes used in cases that resist local measures. It is administered every second day intravenously to the hospitalized patient in gradually increasing dosage. Topical treatment is carried out concurrently. Autohaemotherapy is often carried out in conjunction with local therapy. Ten to twenty cc. of blood are injected I.M. twice weekly in a course of from 10 to 20 doses. There is no valid evidence to warrant its use.

B. TOPICAL THERAPY

1. *Acute phase*

Local therapy should be soothing and only mildly stimulating, and consist of daily bran or oatmeal baths followed by the application of corn (or olive) oil and an astringent such as calamine lotion, or 1% ichthyol in zinc oxide ointment. Bed rest and moderate day-time sedation should be instituted. Stimulating local therapy is contraindicated.

2. *Chronic phase*

i. *Skin*

A number of methods are listed in approximate order of effectiveness. In all cases before an ointment is applied, the patient should take a hot colloid bath and remove all scales with tincture of green soap and a brush. Ointments must be rubbed well into the skin.

Anthralin (Dithranol) ointment is available in 0.25 to 1.0% strengths. It is applied daily in gradually increasing concentrations. Application is continued until erythema and staining appear around the plaques. The treatment is then discontinued until pigmentation disappears. This course may be repeated as indicated. Anthralin should not be used around the eyes or on the scalp.

Chrysarobin is an excellent drug but readily produces conjunctivitis, stains clothing purple and skin and nails brown. It has largely been replaced by Anthralin. But freshly prepared and used carefully, it is considered one of the best single medicaments known. Chrysarobin is incorporated in a petrolatum alba base in strengths of 4 to 8%. It must never be applied to the face and scalp. Apply daily until a slight erythema is detected at the edge of the brownish discolouration produced on the lesion. Its use is then suspended until the reaction has subsided.

Crude coal tar as a 5% ointment is safe and effective, but is mussy and stains clothing. It is not used over hairy areas because of the danger of folliculitis. Its efficacy is greatly enhanced when used in conjunction with ultra-violet radiation.

The Goeckerman - O'Leary Routine usually brings extensive psoriasis to complete involution. It is carried out in hospital. The patient takes a warm bran bath at bed-time, and scrubs the lesions with tincture of green soap and a brush until all the scales are removed. Crude coal tar 4% ointment is applied vigorously to the skin and a ¼-inch thick layer is allowed to remain. In the morning the remaining ointment is wiped off with mineral oil or olive oil. Ultra-violet radiation is given in a dose which produces a transient erythema. A coat of tar ointment is again applied and repeated several times during the day. This routine is continued until free of lesions (about three weeks). Approxi-

mately 85% of patients are cleared. In most instances this routine is just as effective during succeeding exacerbations. If there is scalp involvement, ammoniated mercury (5 to 15%), salicyclic acid (3 to 6%) in cold cream is applied to the scalp.

Salicyclic acid (2 to 5%) in ammoniated mercury ointment (5 to 10%) applied b.i.d. is often helpful in local lesions. The lower concentrations can be safely rubbed into the face, trunk, flexural folds and genitals. This ointment is valuable when tar or Anthralin are contraindicated.

General exposure to the sun often clears resistant lesions. Ultra-violet exposure during the winter months will often produce the same beneficial effects. The results with X-ray treatment are unpredictable, and the danger of radiation dermatitis is always present. However, in some cases X-ray treatment is very effective. If X-ray therapy is contemplated, it should be administered only by an experienced dermatologist. In many cases the lesions disappear completely and rapidly, but recurrences take place as following other forms of therapy.

ii. *Scalp*

The treatment of scalp lesions presents a particular problem. The best preparation is a combination of sulphur, salicylic acid and tar distillate in ointment form. But this preparation is mussy and odourous, so that daily shampooing is necessary. An alternate preparation is salicylic acid (2 to 6%) in ammoniated mercury ointment (up to 20%). If the patient cannot be induced to use an ointment, the following lotion may prove useful:

Resorcinol monoacetate	2
Salicylic ac.	2
Liquor carbonis detergens	5
Glycerin	2
Alcohol 70% ad	100

iii. *Nails*

Treatment is not indicated if the changes are not bothersome. If the nails are more seriously affected and disfigured, X-ray therapy may be useful, but should be administered by an experienced dermatologist.

iv. *Psoriatic Arthritis*

The general treatment of rheumatoid arthritis should be instituted. Temporary improvement in the skin lesions and the arthritis has been reported using parenteral cortisone-like drugs, but after discontinuance of the steroids, the skin lesions become increasingly severe and resistant to treatment. No satisfactory treatment is as yet available.

Prognosis

Psoriasis is controllable but not curable. Twenty per cent of patients are permanently relieved by even the simplest measures. The disease often recurs and may do so for the remainder of the patient's life. Remissions may last weeks, months or years. Permanent relief must never be promised. Treatment must always be carried out until the last lesion is completely cleared up, or recurrences will follow more quickly. This can be a very discouraging disease to both the patient and the practioner. Many patients are seen who have had psoriasis most of their lives, having received every conceivable type of therapy only to have the lesions recur.

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WARTS

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WARTS are cutaneous papillary growths which may be regarded as localized, circumscribed hypertrophies of the prickle cell layer of the epidermis due to the action of a filterable virus. These may be divided into: A. verruca plana—flat wart, B. verruca vulgaris—the common wart, C. verruca plantaris—plantar wart, D. condyloma acuminatum—venereal wart.

Verruca Plana

Flat warts appear as small polygonal yellow-brown epidermal elevations varying in size from a pin head to a pea. They may be single or multiple, discrete, grouped, or coalesced. These flat or dome-shaped growths appear on the face, forehead and the backs of the hands. They are asymptomatic, tend to spread, resist treatment, but often disappear spontaneously.

Verruca Vulgaris

Common warts usually begin as single or multiple tiny circumscribed epidermal thickenings on the backs of the hands, around the nail fold and occasionally under the nail. The colour may be grey, yellow, or brown depending on the amount of hyperkeratosis present. No region is exempt, and there are no subjective symptoms.

If the wart is shaved, radiating brown structures, the bleeding tips of hypertrophied papillae become visible against a background of translucent callous-like epithelium. The hyperkeratotic material located interstitially between the papillae may become macerated or chewed away by a child and a digitate or filiform effect produced. Beneath the hyperkeratotic surface of a large wart, the epithelium is altered and becomes tow-like and pasty. Using cautery or desiccation treatment one must wipe the corium bare of this in order to effect a cure.

Warts may involve the nail fold causing much pain and difficulty in treating. On the scalp verruca vulgaris may have a cauliflower appearance. On the beard region they are spread by shaving, and hence have a tendency to recur even after repeated treatment.

Condyloma Acuminatum

Venereal warts are found on the moist mucocutaneous junctions of the vulva and penis and in the perianal region. In the male they are found on the inner side of the prepuce of the glans penis, especially at the balano-preputial groove. They appear as closely aggregated, pointed, tufted or pedunculated, pink or purple projections of variable length and consistency. They tend to vegetate, and become infected forming pus or sterile decomposing secretions. Although they are auto-inoculable to self or sex partner, they are not truly venereal.

Verruca Plantaris

Plantar warts are common warts which have been flattened into the substance of the skin by constant pressure, and are always surrounded by an area of hyperkeratosis which forms a definite callosity. They may be single or multiple, often occurring on the ball of the foot or on the heel. Often a corn may present with a similar appearance, and will have to be differentiated by paring the lesion. A corn will be seen to be conical in shape, and hence paring will make it smaller; however, paring a plantar wart will reveal its wide base beneath the callous formation, and the tender bleeding tips of the hypertrophied papillae become apparent. Often, a large plantar

wart will be surrounded by a number of small seedlings. They are sometimes associated with a history of trauma in the area. Pain is a late symptom.

Occasionally an aggregation of plantar warts coalesce, and spread peripherally to form a dry relatively painless mosaic-like plaque extremely difficult to treat.

Differential Diagnosis

Plantar warts may be confused with corns and calluses while flat warts may have to be distinguished from the papules of eczema and lichen planus by the colour, distribution and lack of pruritus. Early skin carcinoma may simulate warts, which must also be differentiated from senile keratoma: small, brown, rough, hard elevations found on the areas of skin exposed to sunlight, for these are premalignant and must be removed early. Senile warts, however, are soft, greasy tumours found on the trunk, scalp and face. They may ulcerate on the surface and bleed, but rarely show a malignant tendency.

Treatment

flat warts

These are best left alone; otherwise, use a keratolytic ointment.

common warts

1. Electrodesiccation and curettage—local anaesthetic.
2. Carbon dioxide snow—60–90 seconds.
3. Churchill's iodine followed by 5–10% ammoniated mercury ointment once daily (avoid surrounding skin).
4. Acid—salicyclic or trichloracetic—the warts are then peeled down.
5. Miscellaneous: bismuth, silver nitrate, and psychotherapy.

plantar warts

1. Ninety per cent salicylic acid paste held in place using moleskin cut to size for up to two weeks followed by paring.
2. 1:20 formalin shallow foot baths, ten minutes per day followed by curettage.
3. Electrodesiccation—local anaesthetic.

venereal warts

Twenty per cent podophyllin in acetone. Remove podophyllin with soap and water in 4–6 hours. Re-apply once a week—to be done by the physician and not the patient.

Prognosis

Warts are benign, usually symptomless, growths which tend to disappear spontaneously even if untreated. Painful plantar warts and warts in the nail fold require treatment although the latter are difficult to treat. Recurrences are common.

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TRANQUILLIZERS—A PROGRESS REPORT: Part II

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Introduction

IN his recent article "The History of Tension", Aldous Huxley reminds us that tension arises because of some congenital or acquired weakness and inability to deal with distressing situations. In every culture there have been procedures for relieving tension; from the use of drugs, the musical and gymnastic methods, the many religious movements, to the mystical self-transcendence of yoga and the other spiritual exercises. "It is clear, I think, that the problem of tension will be completely solved only when we have a perfect society—that is to say, never."[1]

Meprobamate (Equanil, Miltown), one of the modern drugs for the relief of tension, has been on the American market since April 1955; the tons of it ingested are strong testimonial to the tremendous need for some "new" form of buffer for the central nervous system of the present day. Meprobamate can be bought over the counter without a prescription in Toronto at a suggested retail price of $6.00 for 50 tablets (100 phenobarbitone tablets sell for $1.00–$2.00). Is it effective? We are coming to realize more and more that in the evaluation of a new drug, psychological influences must be identified and controlled to determine how much of the patient's improvement is due to the drug itself. Even in the days of Charcot, a stuporous catatonic patient's improvement was attributed to Charcot taking his silk handkerchief and wiping the patient's nose.[2] Attention and tender loving care are powerful weapons against disorders of the psyche.

Pharmacology

Meprobamate is 2-methyl-2-n-propyl-1,3 propanediol dicarbamate; it relaxes voluntary muscles, has anticonvulsive properties, and is said to relieve fear and tension. As mentioned in a previous article,[3] the tranquillizers can be divided into two broad groups: the "autonomic suppressants" (phenothiazines, rauwolfia) and the "central relaxants" (meprobamate) which do not affect the autonomic nervous system. Their different effects are summarized:[4]

ACTION	AUTONOMIC SUPPRESSANTS	CENTRAL RELAXANTS
Adrenolytic action	+	−
Anticholinergic action	+	−
Antihistaminic action	+	−
Barbiturate potentiation	marked	slight
E.E.G. changes	generalized	localized—thalamus
Convulsive threshold	↓	↑
Multineuronal reflexes	−	depressed

The action of meprobamate seems to be on complicated circuits in the nervous system involving many neurons; centrally it has a selective action on the thalamus. With low doses there are E.E.G. changes in leads to the ventro-lateral nucleus of the thalamus and only after high doses are cortical and subcortical changes noted.[4,5] Berger postulates that the interneuronal blocking effect of the drug

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diminishes some of the cortical ↔ thalamic impulses thereby relieving some of the "physiologic components of anxiety". This "chemical lobotomy" is analogous to the surgical cutting of the thalamofrontal radiation in the operation known as leukotomy. Changes in electro-myographic recordings, even in patients who have no subjective response to the drug, have been recorded.[6]

Indications and Results

One enthusiastic investigator has claimed that "meprobamate has shown great effectiveness in anxiety and tension states, phobias, tension headaches, psychosomatic disorders, insomnia, premenstrual tension, neuro-dermatitis and behaviour disorders. It has been less effective but still quite helpful in ambulatory schizophrenia, post-traumatic neurosis, petit mal epilepsy, muscle spasm (of various etiologies) and cerebral palsy."[5] The usual dose is one 400 mgm. tablet three times a day with another at bed-time if required. This regimen may be adjusted either way as indicated by clinical response and side effects. When depression is a major feature of the anxiety, concomitant use of one of the amphetamine compounds has been effective. The drug may be discontinued after a few weeks or maintained indefinitely.

As mentioned in the introduction, it is very difficult to assess a new drug objectively; improvement with placebos has been reported in as high as 60% of cases.[7] In patients classified as anxious and tense, Selling reported 68 of 72, or 95%, improved;[8] Borrus observed that 78% improved (52 of 67).[9] West and Fonesca reported 58% improved in a straight trial; these results were substantiated in a double blind controlled trial that showed a "statistically significant superiority of meprobamate over the inert tablet". In the double blind trial with meprobamate and a barbiturate it was found that if either drug was given for a short time to patients with anxiety and tension, about equal results would be obtained.[10] Meprobamate may prove more beneficial, however, as the danger of suicide is greatly reduced. So far, there have been no deaths reported which can be directly attributed to deliberate overdosage.

When meprobamate is used in phobic states where there is an extreme disturbance by specific fears, there seems to be a lessening of intensity of these thoughts and a relieving of the paralysis of action that they cause, although the actual fears themselves are still present. The treatment of tension headaches is very difficult to assess as these characteristically respond to placebos and any new medication. Meprobamate seems to be more effective, however, than other drugs, especially for the patient with nuchal headache with "a tight band around my head" or with a feeling of being "all keyed up".[5,8,11] One or two 400 mgm. tablets taken 15 minutes before retiring are said to be quite effective for treating insomnia which is one of the commonest complaints in medicine. Selling in April 1955 claimed that "since receiving my first shipment of Miltown for clinical trial in January 1953, I have not needed to use a barbiturate or similar somnifacient to engender sleep in any patient. By adjusting the dose of Miltown, it has been possible to produce sleep in every patient except those suffering from a true psychotic depression."[8] Insomnia is relieved probably by the reduction in tension and anxiety since the E.E.G. studies are not similar to the barbiturate sleep pattern. Patients waken without a hangover or drowsy feeling, and previous disturbing dreams are no longer present.[5,8]

In the treatment of idiopathic petit mal epilepsy, this drug is slightly less effective than trimethadione (Tridione), but is as effective as paramethadione

(Paradione). It is to be preferred, however, because of its lower toxicity and because of its action of reducing tension which often is an aggravating factor in epilepsy. As with the other drugs used for the control of petit mal, meprobamate was much less effective in grand mal epilepsy and in some cases made the condition worse.[12] The drug has been advocated for the treatment of alcohol and drug addiction as it relieves the jitters, anxiety, guilt feelings and insomnia. It may help to keep the addict from resuming the use of drugs and alcohol, but there have been increasing reports in the literature of physiological as well as psychological dependence on the drug, and of organic withdrawal symptoms on rapid cessation. At the present time, the use of preoperative and postoperative meprobamate is being explored. By alleviating the anxiety and tension so common in these periods, it aids in early ambulation and return to normality, and reduces the need for analgesics and narcotics from which patients have to be weaned.[16]

Side Effects and Toxicity

Considering the amount of the drug used by the public, remarkably few serious complications have been reported. Drowsiness which subsides spontaneously or on reduction of dosage is commonly noted. Not a few drivers have been charged with their "ability impaired" or falsely accused of being "under the influence of alcohol". Also encountered are dizziness, fatigue, headache, and nausea. Drug eruptions in the form of short-lived erythemas, maculopapular rashes or prolonged serious erythema multiforme with fever have been reported. They usually respond to antihistamines or systemic steroid therapy.[17,18] A fatal case of aplastic anaemia after ingestion of 4 tablets a day for eight days has been reported. This probably represents an individual idiosyncrasy, but the physician should be constantly aware of complications such as these. In listing agents associated with the occurrence of aplastic anaemia, Wintrobe includes urethane which, like meprobamate, contains the carbamate radical.[19] The problem of addiction has been mentioned above; an increasing number of investigators are reporting this complication. It is interesting to read the impressions of one writer: "Because meprobamate has been advertised as being non-habit forming, I would like to modify a preliminary report in which I also stated that meprobamate was not habit forming. Further clinical experience has convinced me that this is by no means always the case and that a few patients do form a harmful habit for this drug."[14] Experienced clinicians remind us that this is a familiar story with all agents advocated for the long term treatment of pain, anxiety and tension.

Summary and Conclusions

In every society and culture man has striven to alleviate tension and anxiety by various means; the use of meprobamate is just another method of insulating the modern central nervous system from "the slings and arrows of outrageous fortune".[20] It should be emphasized that only results from double blind controlled trials are valid, and that each new drug that appears on the market as a panacea should be used cautiously with a watchful eye for idiosyncrasy reactions and toxicity. Although not highlighted in this article, stress should be laid on the importance of counselling and psychotherapy; it is not sufficient to prescribe a drug like meprobamate to be used indefinitely as a crutch. Patients with tension states must be helped to work out their problems or taught to understand and live with their symptoms with less distress.

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MANAGEMENT OF SEVERE THERMAL BURNS

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IT is of fundamental importance in the management of severe thermal burns to realize that one must be concerned not only with the local injury but also with the correction of the accompanying physiological changes. Failure to correct these systemic disturbances and attention to the burn wound only may well prove disastrous; on the other hand, treatment systemically and neglect of the burn wound may lead to a hopelessly infected surface which will be difficult if not impossible to correct.[4]

I. Management of the Physiologic Disturbances

A. first aid

The burned areas should be covered with clean sheets to prevent excessive contamination, but the patient should not be wrapped in blankets and kept excessively warm, as this will increase capillary circulation and increase the burn oedema. Morphine may be given intravenously in small repeated doses of 16 mgm. for the relief of pain and

anxiety. It is wise to use morphine very sparingly and be aware of the dangers of overdosage. In the presence of shock, the patient will appear restless in spite of sedation. Transportation to a hospital should be arranged as soon as possible. If this cannot be done within one-half to one hour, it is very advisable to start an intravenous infusion of Dextran, lactated Ringer's solution or 5% Glucose in normal saline.

B. IN THE EMERGENCY DEPARTMENT

If an intravenous has not been started, it should be commenced at once usually by stab but a cut down with insertion of a cannula and polyethylene tubing is preferable where intensive and prolonged shock therapy will be indicated. Blood is taken at the same time for cross and type. Baseline haemoglobin or preferably haematocrit estimations are also done.

A Foley catheter is inserted, and the admission urine specific gravity and volume are noted. A fluid balance chart should be started on which are recorded all fluid intake and output.

Temperature, pulse, respirations, blood-pressure and state of the capillary circulation should be recorded at ½–1 hour intervals for the first 8 hours.

All clothing is removed and an estimate is made as to the patient's weight and severity of his burns. The latter is especially difficult in the early stages. The extent (%) of body surface involved may be roughly calculated by the "Rule of Nines".[12] This must be modified for children under 2 years of age by increasing the head area to almost 18% (2x) and reducing the leg area to 9% each (1/2). The depth of the wound will vary with the burn agent, the duration of exposure and the type of clothing worn. Considerable clinical experience is necessary to determine on admission the depth by physical examination. Some of the early differential points are outlined in the following chart:

TABLE 1

CHARACTERTISTIC	SECOND DEGREE	THIRD DEGREE
Etiology	Hot liquids Steam Short flash	Flame Hot liquids when spilled over clothes
Colour	Pink and mottled red	Pearly white, charred or coagulated
Surface	Blisters and/or weeping	Dry
Sensitivity	Painful or hyperaesthetic	Anaesthetic

The patient should be examined for complications unrelated to the accident such as cardiac, renal or respiratory disease, and for complications occurring with the accident such as fractures, soft tissue injury and respiratory tract burn by inhalation of hot irritating gases. If the latter condition exists, periodic suction and posturing the patient in the prone position to keep the airway clear are important. Oxygen therapy, preferably with an intranasal catheter, will benefit the patient. A tracheotomy set should always be ready if a clear airway cannot be maintained.

All severe burns should receive protection from tetanus either by toxoid or ATS depending upon previous active immunization. Most surgeons advocate systemic antibiotic therapy as prophylaxis against infection. Penicillin (if no history of allergy) or Dicrysticin are recommended.

C. FLUID REPLACEMENT

The primary purpose of fluid replacement therapy is the prevention and control of shock. Clinical studies have shown that shock may be anticipated according to the age of the patient and per cent of body surface burned.

TABLE 2

Age (yrs.)	% Body Surface Burned
<6	8
6–12	15
Adults <60	20
Adults >60	10

Colloid

The prevention and control of shock are dependent upon the early restoration and maintenance of a normal circulatory plasma volume. This is achieved by early rapid infusions of whole blood, plasma, or plasma expanders. In such an acute emergency as a severe thermal burn the cheapest, most readily available and yet effective colloid is the plasma expander Dextran. Robertson[3] recommends that 1,000 cc. of Dextran be given routinely in the first 1–2 hours, for he has shown that haemoglobin levels as high as 130% on admission can be returned to below 90% within 1½ hours. Since Dextran is rapidly eliminated in the urine (70% in 24 hours), it should be replaced by a volume of whole blood equal to that of Dextran required to control haemoconcentration.[3] This is especially necessary in the third degree burns or where the systemic reaction to the burn has been marked. Children with more than 30% burn should be transfused within the first 48 hours with a volume of whole blood equal to 2–4% of body weight in kilograms.

Evans[8] believes that early transfusion with whole blood is of paramount importance, for it restores both the circulatory red blood cell volume as well as the plasma volume. Gelin,[10] however, feels that the haemoconcentration present in the acute stages is a contraindication for whole blood since it would theoretically increase the amount of sludging and trapping in the capillaries. But experiments by Quinby and Cope[9] fail to show any ill effects from the augmented haematocrit and viscosity that results from whole blood transfusion.

It would seem, therefore, that whole blood should be given as soon as possible, but because it is not usually immediately available Dextran should be given so that it may act as an excellent although temporary restorer of plasma volume.

Electrolytes

Electrolytes are not as important as colloids in the early stages of therapy. Mason and Bell[4] state that "in the absence of vomiting we have not observed electrolyte deficiencies provided the clinical response to blood and plasma or plasma expander has been satisfactory". They are used in the first 48 hours to (1) replace the lost serum electrolytes and thereby maintain the osmotic relationships between the extracellular and intracellular fluid compartments, thereby preventing cellular dehydration; and (2) maintain a circulating plasma volume to keep the urinary output at a constant adequate level.

Recent clinical studies have shown that replacement with normal saline alone is undesirable, for there is a tendency in the first 24 hours for serum chlorides to increase and bicarbonate to decrease resulting in a hyperchloremic acidosis.[12] Only balanced solutions that contain either a physiologic ratio of serum Na:Cl of approximately 3:2 or are buffered with an acetate or bicarbonate salt should be used.

Either the oral or intravenous route may be used. It may be unwise to use

the oral route in the first 48 hours because of the danger of poor tolerance with vomiting. Parenteral therapy is reduced in proportion to the oral intake.

Suggested I.V. solutions are: Ringer's Lactate and Molar Sodium Lactate.

After 48 hours, sodium begins to be reabsorbed from the burn compartment and a diuresis occurs. Because of the danger of water intoxication electrolyte infusion must then either cease completely or be given only to maintain a certain urinary volume and serum sodium (outlined in Guides to Therapy below). When the diuresis occurs, electrolyte control can be achieved by the oral route alone. The oral route is to be preferred in cases with chronic pulmonary and cardiac disease and especially with respiratory tract burns.

Serum potassium begins to fall after the 3rd day especially if no food has been taken by mouth so that parenteral therapy of 3 m. Eq./kilo. daily for infants[2] or a total of 80–130 m. Eq. daily for adults may be given if good renal function exists.

Metabolic Water

Water is lost normally from the body daily by sweating, respiration, defecation and urination. Daily replacement for children may be estimated as follows:

TABLE 3

Age (yrs.)	ml. of H_2O/Kgm.
<2	~~60~~ 120
2–5	100
5–8	80
8–11	50

Adults should receive a maximum of 2,000 cc. daily.

In the absence of vomiting this may be given orally, but electrolyte-free solutions are undesirable in the first 48 hours since they will aggravate a low serum sodium. Often a 5% glucose solution in distilled water is given so that calories and a "protein sparing carbohydrate effect" may be given at the same time.

D. ESTIMATION OF FLUID REQUIREMENTS FOR FIRST 48 HOURS

Formulae

Adults: Probably the most useful and widely used formula is that of Evans.[8]

(1) Colloids: 1 cc./kilo x % body surface burn = "x" cc.
(2) Electrolytes: 1 cc./kilo x % body surface burn = "x" cc.
(3) Metabolic Water (5% glucose) = 2,000 cc.
Total for 1st 24 hrs. = (2x + 2000) cc.

Children: A simple and satisfactory formula suggested by Farmer at Sick Children's Hospital is given.

(1) Colloids: 4 cc./lb. x % body surface = "x" cc.
(2) Electrolytes: 4 cc./lb. x % body surface = "x" cc.
(3) Metabolic water (5% glucose) see Table 3 = "y" cc.
Total for 1st 24 hrs. = (2x + y) cc.

The above formulae have the following provisions:

1. The maximum fluid intake daily is 10% of the total body weight.
2. Burns with greater than 50% burned surface must be calculated as if they were only 50%.
3. Fluid is to be administered as follows:
   (a) 1/3 to 1/2 of the total 24-hr. volume within the first 8-hour period with preference given to colloids.
   (b) 1/4 within the second 8-hour period.
   (c) 1/4 within the third 8-hour period.

However, all formulae require an accurate assessment of body weight and the depth and extent of the burn. This

is often difficult in the early stages. The tendency is therefore to overhydrate, and this is very dangerous in children and in older adults especially if complicated by pre-existing disease. Most surgeons now agree that the use of formulae is limited to providing a rough guide to fluid therapy that must be subjected to modifications based upon frequent clinical observation and the results of a few simple and periodic laboratory tests.

E. GUIDES TO FLUID THERAPY

Clinical Observation

Observation and charting of the vital signs q. 1/2–1 h. during the first 48 hours are essential for proper treatment. Vomiting, thirst and restlessness are signs of inadequate plasma volume. Special consideration will be necessary for those cases with complications.

Fluid Balance Chart

This will give a good indication of the patient's progress. When fluid output exceeds the input, parenteral therapy may be stopped if fluids can be tolerated by mouth.

Urine Volume

This is measured every 1–2 hours. Ideally the output should be 25–50 ml./-hour. If the output falls to 10–20 ml./-hour "the water intoxication test"[2] should be performed. Twenty-five ml./-kilo of 5% glucose solution is given intravenously within 45–60 minutes. If there is no increase in urine volume/hour, renal tubular damage should be suspected and all intravenous therapy should be stopped. If the urine volume increases, more vigorous fluid therapy is indicated.

When the diuresis occurs, the urinary volume will be greater than 200 ml./hour and one must either stop all intravenous therapy or give only enough to maintain 100–150 ml./hour.

Urine Specific Gravity

When taken every 2–3 hours this is a useful indicator of the circulating plasma volume. It will increase when the plasma volume is low even before there is a change in the haematocrit.

Urinary NaCl

During the first 24 hours only this will give a rough idea of the adequacy of NaCl administration. Three gm./litre is the ideal urine finding.

Haematocrit or Haemoglobin

This is determined every hour for the first 8 hours, then every 3 hours till 24 hours have passed, and then weekly. But many observers consider these determinations as unreliable indicators of circulating plasma volume in the first 48 hours, since they reflect red cell as well as plasma loss. Later they will indicate the presence of anaemia and the need for whole blood.

Serum Sodium

When the diuresis occurs, serum sodium levels rise to 150–160 m. Eq./1. and are dangerous. By administering electrolyte-free water an attempt should be made to maintain a level of 135–140 m. Eq./litre.

Serum Potassium

This should be checked periodically when the diuresis occurs to prevent it falling to dangerously low levels.

F. DIET

There is a loss of protein into the burn compartment and the dressings, a rise in the B.M.R., and an increased protein catabolism. All this leads to an inevitable weight loss, as high as 1 pound per day for several weeks. A 4,000 calorie diet with a high protein intake of 3 gm./kilo daily is indicated. This is accomplished by the use of supplementary feedings

such as Complan[6] (1–1.5 lb. daily). The essential vitamins should be given in therapeutic doses except for vitamin C, where a daily dose of 1.0–1.5 gm. is recommended. It is preferable that these be taken by mouth, but when this is impossible 5% glucose in 2,000 cc. distilled water given intravenously will produce some protein-sparing action for several days. Forced feedings and intragastric drip should be withheld the first week since severely burned patients rarely tolerate such feedings, and are in danger of vomiting and aspiration.

II. Management of the Burn Wound

A. initial care

Relief of Pain

General anaesthesia should never be used for the initial care of burns because of the danger of precipitating or aggravating burn shock. If sedation is necessary, small doses of morphine intravenously or small doses of barbiturates given rectally are adequate. Exclusion of drafts and gentle manipulation of the patient will also reduce pain.

Cleansing

Strict aseptic technique must be used. The general rule advocated at present is "the less trauma and debridement necessary the better". Gross dirt, ashes and bits of burned clothing are washed off with warm saline or Cetabrom. Adherent substances such as tar are best left alone.

Debridement

Surgical gloves are changed and all loose tags of tissue and remaining debris are removed with forceps and scissors. Extensive excision of devitalized tissue is avoided. Unbroken vesicles should not be excised or incised but only punctured by a needle to have their fluid content removed.

B. definitive treatment

1. *Immediate Radical Excision and Graft*

This method can be used in cases of a small localized and obvious third degree burn. Immediate radical excision down to the fascia is followed by a graft. There is usually a complete take, and the area is healed in 10 days. Rotation grafts give excellent results while split grafts are less desirable because of the ugly depressed appearance that follows.[3]

2. *Open Method*

It is recommended[3] that this method be used either when the burn is small in size and localized to an area such as the trunk or thigh, or when the burn is obviously only second degree. The patient lies directly upon polyethylene sponges which are changed daily and re-sterilized.[6] The sprinkling of an aluminum powder produces a pliable eschar which makes local management easier. However, the opaque eschar that results makes recognition of the depth of the burn difficult, especially since it does not separate until about the 28th day if the burn is third degree. Since infection with pyocyaneus tends to occur at about the 4th week, it is wise to do an excision and graft before this time. But this may require an excision which is unnecessarily deep because of the difficulty in estimating the depth. If the excision is down to the fascia, a deformity will be produced. If done superficially, edematous fat will form an undesirable bed for the graft unless a dressing be applied for 48 hours before grafting to allow the formation of granulation tissue over the fat.[3]

3. *Closed Method*

This method is favoured for the more extensive burns that have large areas of second and possibly third degree involve-

ment, or when there are areas involved such as the face and hands where it is of great value to know exactly the depth of the burn in order to avoid having to excise too widely.

The standard form of dressing is composed of three layers, but recent work has shown that the use of the 2nd layer (dry fluffed gauze or cellucotton) which provides resilent compression is unnecessary. All that is needed, therefore, is a single thickness of fine-meshed gauze, either plain or dry, e.g. Jelonet, covered by large amputation or dressing pads. All local medications such as boracic acid or tannic acid are contraindicated. Burned extremities should be elevated.

The initial dressing is checked daily. Exuded secretions will predispose to infection; loose dressings cause mechanical irritation and constricting bandages cause discomfort and aggravate the edema distally.

In 7–10 days the initial dressing is changed under operative conditions. Rectal Pentothal is used as an anaesthetic and whole blood is given intravenously if considerable bleeding is anticipated. Obvious necrotic superficial tissue is removed before the wound is redressed. If there is considerable discharge present, the layer of Jelonet or vaseline gauze may be omitted. This procedure is repeated every 48 hours for 3–4 times. In this way the burned surface is gradually prepared for grafting, thereby doing away with frequent dressing followed by a radical excision.[3] Although it is a more tedious procedure, it is less traumatic and achieves a better result both in appearance and function because usually the graft has the opportunity of being placed upon healthy granulation tissue which will maintain the characteristics of the subcutaneous tissue. In most cases skin grafting can be performed by the 18th day.

C. INFECTION (PREVENTION AND CONTROL)

All burn wounds are contaminated! If virulent bacteria can grow in devitalized tissue in the first 24–48 hours, they may produce either a toxaemia or local cellulitis. That is why prophylactic tetanus sera and antibiotics are given systemically. However, secondary contamination can occur on the 7th day when the dressings are changed. Staphylococcal and streptococcal pathogens are the main invaders. Culture of the blood and wound together with antibiotic sensitivity tests will indicate the proper broad spectrum therapy to use. At about the 4th week, the main infecting organism has been found to be Pyocyaneus. Polymixin B acts specifically to destroy this organism.

Local therapy is not as effective as parenteral and is used only when the ears and nose are burned. Broad spectrum ointments covering these areas may prevent the onset of a complicating chondritis.[3]

The best deterrent to infection is probably not so much the use of prophylactic antibiotics but rather such measures as early cleansing and removal of necrotic tissue following by skin coverage before the 4th week with the use of aseptic technique at all times.

D. SKIN GRAFTING

"All burned areas should be debrided or excised by the 21st day, and all major areas of burn, no matter how extensive, should be grafted in 6 weeks provided the patient has sufficient donor area to permit it."[3] Because of the need for closure of the burn wound as soon as possible, other types of grafts may be used if the patient has insufficient donor sites.

(a) *Autogenous Grafts*

In these types the patient's own skin is being used, but is spread intermittently

over the burned area either as segmented dermatome grafts or as strips of tissue between homografts. The autogenous skin will proliferate and give permanent epithelial coverage eventually.

(b) *Homografts*

The source of skin may be either cadaveric or from a living donor. Cadaver skin must have been properly stored. These form an effective biological dressing which may give life saving support. But since it is foreign to the recipient, it is eventually destroyed by an immune reaction unless the donor is an identical twin or the recipient has agammaglobulinemia. However, it is hoped that by this time the donor will have had a sufficient re-growth at his donor sites to cover the remaining ungrafted areas. If not, the prognosis will be very poor.

The dressings can be removed about 7 days later without anaesthetic. Thereafter, the dressings are changed daily. When the patient is able to help himself move and can sit up, daily burn baths can be given before changing the dressing.

A programme of physiotherapy should then be started, especially when areas are involved that are likely to develop contractures.

Summary

The management of severe thermal burns has been discussed. For purposes of discussion the problem has been divided into two main parts: the first deals with systemic disturbances in which the measures for the prevention and control of shock as well as the maintenance of adequate nutrition are discussed; the second is concerned with the prevention of infection and the restoration of skin surface by the covering of the burn wound with a skin graft.

Both aspects of burn therapy require prompt, aggressive, simultaneous and adequate attention for a successful result.

Acknowledgement

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PLEURAL EFFUSION

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THE accumulation of excessive amounts of fluid in the pleural space is a frequent manifestation of serious thoracic disease—pulmonary or cardiac—and occasionally is the first evidence of some other profoundly important systemic disease. Under normal conditions there is no pleural space; the visceral and parietal pleura are in contact except for a lubricating film of fluid. This fluid is regarded as a secretion, derived chiefly from the visceral surface. Normally it is absorbed by both visceral and parietal layers, at a rate identical with its formation. Any disturbance of absorption or increase of formation of fluid will lead to a pathological collection in the pleural space.

Etiology

Any process which will cause oedema in other parts of the body will cause abnormal collections of pleural fluid. Thus inflammatory and circulatory disorders are the principal causes of excess fluid formation. The inflammation is most commonly due to pulmonary disease. The circulatory congestion is usually secondary to heart disease, but congestion of the chest wall circulation as occurs in obstruction to the azygos veins may lead to effusion. This "weeping" of the pleura may also be the result of an osmotic imbalance between the two sides of the capillary membrane, commonly from those metabolic disturbances which deplete serum proteins, especially albumin, or from sodium retention in the tissues. Most of the causes are included in the following classification:

A. Bacterial Infections
   1. Tuberculosis
   2. Bacterial pneumonias
   3. Pulmonary abscess
   4. Infected bronchogenic carcinoma
   5. Infected pulmonary cyst
   6. Brucellosis
   7. Tularemia

B. Viral and Rickettsial Causes
   1. Atypical pneumonia
   2. Viral pneumonias
   3. Psittacosis
   4. Q fever

C. Fungal and Protozoal Causes
   1. Coccidioidomycosis
   2. Actinomycosis
   3. Blastomycosis
   4. Torulosis
   5. Amoebiasis
   6. Echinococcus cyst

D. Malignant Diseases
   1. Bronchogenic carcinoma
   2. Metastatic carcinoma
   3. Mediastinal tumours
   4. Lymphomas
   5. Chest wall tumours
   6. Pleural tumours

E. Cardiac and Vascular Disorders
   1. Congestive heart failure
   2. Pulmonary embolism
   3. Pericarditis
   4. Superior vena caval obstruction

F. Lymphatic Obstruction
   1. Lymphomas
   2. Mediastinal tumours
   3. Metastatic tumours
   4. Traumatic and malignant chylothorax

G. Hypoproteinemia
   1. Cirrhosis of liver
   2. Nephritis and nephrotic syndrome
   3. Malnutrition
   4. Severe anaemia of any cause

H. Miscellaneous Causes
   1. Rheumatic fever
   2. Collagen diseases

3. Ovarian tumours (Meig's Syndrome)
4. Trauma
5. Pneumothorax (spontaneous, induced or traumatic)
6. Hemothorax
7. Thoracotomy
8. Idiopathic

Clinical Features Common to All Effusions

The symptoms and signs of dry pleurisy often precede the development of effusion, but the onset in other cases may be insidious with little or no pain.

Fever occurs in most cases, but is more severe in the presence of infection, and more protracted when the infection is tuberculous. The principal symptom is dyspnoea, the severity of which depends on the size of the effusion and the rate at which it accumulates. In the early stages there may only be dyspnoea on exertion; as the effusion increases there may be dyspnoea at rest accompanied by cyanosis.

Most authors agree that at least 300–500 cc. of fluid must be present before effusions can be detected by physical examination. There is diminished or absent rib movement on the affected side; the trachea and apex beat are shifted to the opposite side if a sufficiently large amount of fluid is present and the mediastinum is mobile. Vocal fremitus is absent over the fluid, and the percussion note is flat. Breath sounds are usually absent over the fluid; however, sometimes breath sounds are transmitted to the chest wall even more readily when fluid is present, probably because of compressed airless pulmonary tissue beneath the fluid which is adherent to the chest wall at some points. Vocal resonance is usually absent over the fluid; sometimes, however, bronchial breathing may be heard over the upper margin of the fluid, and occasionally aegophony may be elicited.

X-ray Features

Moderately extensive effusions are readily seen on X-ray of the chest. The classical shadow is a dense uniform opacity in the inferolateral parts of the hemithorax. The opacity is higher laterally than medially and sweeps around in a characteristic curve. This curve is due to the fact that laterally the mass of fluid tapers upwards to a thin edge. If a horizontal fluid level is demonstrated, air or gas has gained entrance to the pleural space. This can happen following a thoracentesis. If no thoracentesis has been carried out, the presence of an air-fluid level indicates a present or former communication with the tracheo-bronchial tree. Small amounts of fluid which merely obliterate the costo-phrenic angle may be best distinguished from pleural thickening or adhesions by taking AP or PA films of the chest while the patient lies on one side, and then on the other side. The fluid gravitates to the lateral chest wall and casts a much more evident shadow than when the patient is in the erect position.

Differential Diagnosis of Fluid

The presence of a pleural effusion can usually be recognized from the physical signs, but in some cases it may not be suspected until radiological examination is carried out. Absolute proof that fluid is present can be obtained only by aspiration. The thoracentesis should be done over the area of maximum dullness on percussion or at the site of radiological opacity. If no fluid is obtained after repeated attempts, the clinical findings and radiological appearance should be reassessed with the following possibilities in mind:

1. Lobar pneumonia.
2. Absorption collapse.
3. Thickened pleura, which may give similar physical signs except that the mediastinum is either central or displaced towards the side of the lesion.

Thickening may be recognized by the sensation of resistance transmitted from the point of the needle to the hand manipulating the aspirating syringe when the pleura is penetrated.

Laboratory Investigations

Investigations apart from the diagnostic aspiration are important in determining the cause of a pleural effusion. A total and differential white count of the peripheral blood as well as a sedimentation rate must be done. The sputum should be cultured for both pyogenic and acid-fast organisms. Cytological studies on the sputum for malignant cells are also important. Sputum inoculations of guinea pigs, gastric lavage and a tuberculin test are all important investigations.

As for the pleural fluid the following procedures should be carried out:

1. Gross observation including colour, odour, viscosity, turbidity and coagulability.
2. Specific gravity.
3. Total and differential white cell count.
4. Protein determination.
5. Culture and sensitivity tests including cultures for aerobic and anaeorbic organisms, acid-fast bacilli (and fungi if the others prove negative).
6. Guinea pig inoculation.
7. Microscopic examination of gram and acid-fast stained smears of the centrifuged specimen.
8. Cytologic studies for malignant cells.

Particular Features of Some Pleural Effusions

Important in the diagnosis of the cause of pleural effusion is the determination of whether the fluid is an exudate or a transudate. An exudate is due to inflammatory changes in the pleura itself, and is characterized by a specific gravity of 1018 or higher, a protein content of over 3%, and clotting on standing. A transudate has a specific gravity of less than 1015, a protein content of usually 0.5–1.5%, and does not clot on standing. There is also an absence of or only an occasional inflammatory cell present.

It is beyond the scope of this article to consider all the causes of pleural effusion in detail, but some of the more important causes such as tuberculosis, pneumonia, malignancy and causes of transudates will be dealt with a little more thoroughly.

TUBERCULOSIS

Tuberculosis is one of the most common causes of pleural effusions. It is important for the student to realize that a normal lung field on X-ray with negative bacteriological findings in the sputum and pleural fluid does not exclude tuberculosis as the cause of the effusion; and in young adults tuberculosis should be assumed unless the tuberculin test is negative or some other cause can be clearly established. Although tuberculous effusions cannot occur in the complete absence of the bacillus, the number of bacilli may be small; and the severe pleural reaction may be a manifestation of hypersensitivity to tuberculoprotein which has gained access to the pleural space from an adjacent pulmonary lesion.

The onset of tuberculosis may be sudden with severe pleuritic pain preceding the effusion by several days; or there may be complaints of ill health, loss of weight, remittent pyrexia which may rise to 101–103° F. and night sweats. Cough may or may not be present, and if so it is usually mild, and the tubercle bacilli can rarely be isolated from the sputum. The fluid is amber or straw coloured with a specific gravity of 1018, a protein content of over 4%, and clots on standing. The cells are chiefly (90%) lymphocytes. If the polymorphs are high, either the effusion is not tuberculous or a secondary infection

has been introduced; however, if the fluid is examined very early in the disease, polymorphs may predominate. Less than 50% of tuberculous effusions yield the organism. Deceptive is the fact that after the effusion has disappeared the patient may appear healthy with no signs or symptoms and a normal chest X-ray, yet active tuberculosis may follow the effusion immediately, but more characteristically there is a prolonged latent period before pulmonary disease appears. It must be emphasized that one who has recovered completely from a pleural effusion is still in danger of developing active tuberculosis in a few years.

PNEUMONIA

Only a few words are necessary to describe the fluid in pneumonia. Pneumonia can usually be diagnosed on history, physical and X-ray examination. If an effusion does develop it is usually small in quantity, amber or straw coloured, with a predominance of polymorphs and a specific gravity of 1018 or higher. It is usually sterile on culture, but culture and sensitivity tests should nevertheless be carried out. If therapy is not vigorous enough or the bacteria are resistant to the antibiotic, the effusion may become purulent.

MALIGNANCY

The commonest cause of pleural effusion over the age of 45 is malignant disease. Primary lung tumours or metastatic malignant tumours may first manifest themselves by pleural effusion. The effusion due to malignant disease forms rapidly and in massive amounts, usually re-forming promptly after aspiration, producing pulmonary compression and respiratory difficulties. The fluid at first may be serous and yellow, simulating a tuberculous pleurisy, but later it is characteristically bloody or stained with blood pigment, sometimes resembling port wine in appearance. Either polymorphs or lymphocytes may predominate and fragments of malignant tissue or individual cancer cells in the pleural fluid may be recognizable on microscopic examination. Sometimes it is difficult to distinguish malignant cells from large swollen endothelial cells often present in the pleural fluid. If radiological and cytological studies reveal nothing, bronchoscopy and even thoracoscopy should be considered.

HYDROTHORAX

This is a transudation (filtration) of fluid from the vascular systems to the pleural space. It results from (*a*) increased pulmonary vascular permeability due to circulatory congestion, (*b*) lymphatic blockage, (*c*) diminished plasma osmotic pressure from loss of albumin, (*d*) sodium retention and (*e*) obstruction to the azygos vein or superior vena cava. It is more common on the right side than on the left, but if progressive, the hydrothorax eventually becomes bilateral. It is also seen on the left side in some cases of left ventricular failure.

The most common cause of hydrothorax is congestive heart failure. History combined with such physical findings as dependent edema, jugular venous distension, congestion of the liver as well as pulmonary congestion are diagnostic clues. The fluid obtained in a hydrothorax is clear, pale yellow, of low specific gravity, and has a protein content of less than 3%. X-rays may give further clues that the effusion is due to chronic passive congestion by showing an enlargement of the heart and increased bronchovascular markings.

THORACENTESIS

Thoracentesis should not be done indiscriminately, but there are certain indications both therapeutic and diagnostic such as:

1. Mechanical relief of dyspnoea.
2. Re-expansion of lung and obliteration of the pleural space in an inflammatory pleurisy.
3. Obtaining diagnostic information from the fluid and injection of drugs.
4. Visualization of lung on X-ray examination after the fluid has been removed.

Treatment

Treatment is, of course, the treatment of the underlying disease. It is hoped that the reader is aware that pleurisy with effusion is never a trivial event, and should be considered as an ominous sign of serious local or systemic disease.

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OBSTETRICAL ANAESTHESIA AND ANALGESIA

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THE following discussion will attempt to concentrate on a logical approach to the choice of anaesthetic technique on the part of the obstetrical anaesthetist. The properties and idiosyncrasies of the drugs and methods will not be described in exhaustive detail since they are largely identical in obstetrical and non-obstetrical anaesthesia. However, it is hoped that those points important to the obstetrical choice will be given their proper emphasis.

The Ideal Drug

It does not exist, but if it did, it would have the following characteristics: (1) it would give adequate relief of pain and anxiety, (2) it would be absorbed and excreted rapidly, (3) it would not reduce the strength or frequency of contractions, (4) it would be non-toxic to mother and foetus, (5) it would allow the baby to be born awake and vigorous.[1] The anaesthetist must make his choice of technique and agent to approximate this ideal in each situation; to do so he must be intimately acquainted with a wide variety of agents and also with the physiological changes which have taken place during pregnancy.

Changes in Pregnancy Affecting Anaesthesia

(1) The rise in blood volume and cardiac output associated with pregnancy imposes added strain on the maternal circulatory system. As a result the mother is less able to withstand shock and anoxia. (2) There is a greater disposition to anoxia due to the fall in the haemoglobin level (11 gm. % being quite usual). Also since cyanosis is related to an absolute quantity of reduced haemoglobin (5 gm. %), and the normal reduced haemoglobin level is much lower in the anaemic patient, cyanosis is apparent only with a severe degree of anoxia. This important sign thus becomes much less useful to the obstetrical anaesthetist. (3) There is an increased tendency to hypoglycemia and acidosis because the liver has a diminished capacity to store glycogen. If CO_2 is allowed to build up during delivery,

the patient will become acidotic very quickly. (4) The blood-pressure is more labile during pregnancy. In part it is maintained by an increased spinal neurogenic tone. Spinal anaesthesia abolishes this tone, a factor which possibly accounts for the more frequent occurrence of precipitate hypotension in obstetrical spinal anaesthesia. (5) The greater oxygen demand in pregnancy is compensated by an increased vital capacity. Whenever disease or mechanical factors prevent this increase in vital capacity, the danger of anoxia is increased. (6) The patient's abdomen contains a large movable mass which in Trendelenburg moves upward and splints the diaphragm, thereby reducing vital capacity. (7) The anaesthetist must always remember that the foetus is depressed much more easily by drugs, anoxia and hypotension than the mother. Every systemic analgesic and anaesthetic crosses the placental barrier, and will depress the foetus if in sufficient concentration. The oxygen saturation of the foetal blood is 50–80% as compared with the maternal oxygen saturation of 95%, so that the foetus is always on the verge of anoxia. In addition Beck points out that the oxygen saturation of the blood flowing out of the intervillous spaces diminishes throughout pregnancy indicating that birth takes place just in time to avoid foetal asphyxia. From these observations it becomes apparent that a slight fall in maternal oxygen saturation during delivery might have a very grave effect on the foetus. Finally it has been demonstrated that blood no longer enters the placenta after maternal blood-pressure has fallen to 80 mm. of mercury indicating the importance of maintaining maternal vascular tension.[2]

Anaesthesia in a Normal Delivery

The delivery may be divided into two stages (1) from the onset of pains until the head presses on the perineum, and (2) the remainder of the time until the baby is born.

The *first stage*: The goal of the anaesthetist here is to pilot the mother through her pains either by reducing her sensitivity to them or by obliterating them from her memory. At the same time the mechanics of birth must continue unabated. The latter is usually assured if no medication, except perhaps a minimal dose of barbiturate, is given until pains are well established. Three combinations have been most commonly employed: (1) morphine and hyoscine, (2) barbiturates and hyoscine, and (3) demerol and hyoscine. If successful, they all produce a blissful state in which the mother dozes peacefully between pains while wakening with them to bear down actively. Demerol and hyoscine would appear the most favourable combination since as Heyland points out asphyxia neonatorum occurs much less frequently than with the other two.[3] In addition respiratory depression and vomiting seem to be less common. The following routine has been used with success: 100 mgm. Seconal after pains have begun; when the cervix is dilated 5 cm. in primips or 3 cm. in multips, give 100 mgm. Demerol and 0.4 mgm. Hyoscine. Hyoscine can be repeated in 1 hour if necessary, and both may be repeated every 4 to 6 hours.

Once pains have become established and strong, intermittent anaesthesia may be used. Nitrous oxide and oxygen, and trilene are quite popular. Nitrous oxide and oxygen has the disadvantage that it must usually be administered by an attendant, whereas trilene may be self-administered. Both agents can cause cessation of contractions if given too soon or in too great a quantity, but this hazard is unlikely if proper concentrations are used and pains are well established. According to some anaesthetists it is risky to switch to an inhalation agent requiring a soda-lime

filter after trilene for fear that the trilene residue left in the lungs will be converted to phosgene.[4] The trilene should always be adequately blown off with oxygen before the switch is made.

Stage two: The goal here is to provide sufficient relaxation and freedom from pain as the baby is born to give the obstetrician complete control of the situation. Almost any anaesthetic technique, general or regional, will do. It is far more important to be well acquainted with one particular agent in which you have confidence than to know many casually. The following paragraph will attempt to enumerate the most popular methods with any points which might have an effect on the obstetrical picture.

The simplest technical procedure is no anaesthesia at all. In multips and also with intelligent primips it has been shown that the mother can be taught to relax emotionally and physically during the actual birth so as to consciously help the obstetrician. Many modifications of the natural childbirth method may be applied, with the addition of morphine, demerol, hyoscine or trilene in the first stage being rather popular. If trilene has been used intermittently during the first stage, it may be used continuously during the second stage, its chief drawback being an inability to produce good relaxation except at high concentrations. Nitrous oxide and oxygen is also quite suitable although once again increased relaxation can be reached only at anoxic levels. Fortunately normal deliveries do not require a great deal of relaxation, and unless complications develop nitrous and trilene are quite good enough. Cyclopropane and ether are very suitable because they do allow a high degree of relaxation with comparatively good oxygenation. Ether should be the choice of the untrained anaesthetist because it can be given by open drop, gives clear signs of depth, and has a large margin of safety. There is, however, a tendency to depress foetal respiration; for that reason it should not be given earlier than ten minutes before delivery. Vomiting and aspiration of vomitus occur slightly more frequently with ether. Cyclopropane can induce anaesthesia rapidly with rapid post-delivery recovery, and will not interfere with the progress of labour unless too much is given. On the other hand cardiac arrhythmias are common, vomiting occurs in a majority of cases, capillary oozing seems to be increased, and pituitary extract cannot be used because it has the same effect with cyclopropane as adrenalin. Hershenson also feels that cyclopropane has a tendency "to produce foetal hypoxemia in the presence of good maternal oxygenation".

Any and all of the regional techniques may be used. Their particular advantages are that they do not affect the foetus transplacentally and that they allow the mother to remain conscious and therefore in less danger of respiratory embarrassment. If anaesthetized below D_{10} by spinal, epidural or caudal techniques, pain is obliterated while involuntary contractions continue. However, voluntary bearing down efforts are abolished with the result that a forceps rate of 80% exists. In addition spinal anaesthesia is prone to cause hypotension, post-delivery headache, nausea and neurological changes. Kennedy, Effron and Perry report an incidence of 0.26% chronic adhesive meningitis with paralysis and 0.25% cranial nerve involvement.[5] The Royal Victoria Hospital uses spinal anaesthesia routinely, and finds that hypotension is controlled adequately by administering 3/4 gr. ephedrine (½ I.V. and ½ I.M.) at the same time as the anaesthetic.[2] The extradural technique is much more popular here; its advantages as compared with spinal and general techniques are given in the table from Dawkins and Evans.[6]

EPIDURAL ANAESTHESIA

Advantages over Spinal Analgesia	Advantages over General Anaesthesia
1. No danger of meningitis	1. No special danger of paralytic ileus
2. No post-operative headache	2. Chest complications much fewer
3. Spread to medulla impossible	3. No excess bleeding
4. Less fall of blood-pressure	4. Operative shock much less
5. Greater limitation of anaesthetized area to segments required	
6. No temporary paralysis of bladder or rectum	
7. Can sit up immediately on return to bed	

Epidurals unfortunately require considerable experience, and are a difficult technical problem in the excited patient. Caudal block possesses most of the advantages of the epidural technique since the agent is introduced into the same space but at a lower level. Unfortunately the area of injection is dirtier, while injection is impossible in 20% of cases due to anatomical abnormalities. Pudendal block is a beautiful technique except for its technical difficulties which are chiefly of the nuisance variety. If the block is successful, perineal pain disappears, yet voluntary and involuntary contractions are still possible. Sometimes in multips injection of local anaesthetic along the episiotomy line is sufficient.

The Complicated Delivery

Far more important to the anaesthetist are the complications which may accompany labour and which may influence his choice of anaesthesia drastically. The following discussion will attempt to cover those most important aspects from an analgesic point of view.

1. *The full stomach*: "Vomiting and aspiration are probably the greatest causes of controllable morbidity in the obstetrical patient."[4] Altogether aspiration of vomitus accounts for 50% of maternal deaths, and most vomiting is the result of a patient going into labour with food in her stomach. Digestion takes place very slowly after the onset of labour so that food may remain even after 6 to 10 hours. Anyone who has eaten in the last six hours before delivery should be treated as having a full stomach. If possible the contents should be sucked out, largactil or gravol may be given, and if concern still exists, inhalation anaesthesia should not be used. Trilene intermittently might be the one exception to this rule since pharyngeal reflexes are not abolished.

2. *Prematurity*: The premature foetus is very easily depressed transplacentally; therefore, sedation must be minimal. Hyoscine and demerol are preferred because of their lesser depressant effect, but should be given sparingly. If inhalation anaesthesia is used, the planes must be kept light; for this reason ether becomes the choice since it is easily controlled. Once again regional anaesthesia would seem to be advantageous because of the absence of transplacental poisoning. The findings of Masters and Ross would seem to support this view.

	Mortality[5]
244 prematures under 2,500 gm. conduction anaesthesia	10.7%
347 prematures under 2,500 gm. inhalation anaesthesia	20.8%

3. *The exhausted debilitated patient*: Reserves of glycogen are probably depleted, and acidosis might have ensued. Ether, chloroform, and intravenous barbiturates will accentuate this trend; they should therefore not be used. Agents which might favour anoxia are also dangerous since anoxia interferes with the transfer of lactic acid to glycogen.

The mother should be well sedated to ensure rest between pains and supportive measures such as intravenous therapy should be instituted.

4. *The diabetic*: The problems are similar to those of the debilitated patient. Intravenous glucose should be running continuously, and adequate insulin should be given. If a caesarean section is desired for a premature infant, deep inhalation anaesthesia should be avoided for fear of anoxia. Priscilla White uses spinal anaesthesia without premedication in these circumstances.

5. *The cardiac patient*: Every patient with a cardiac history must be considered potentially dangerous. Anoxia must be avoided at all costs since it predisposes to ischemia, failure, and arrhythmias. Scopolamine and barbiturates are said to increase muscular activity and heart work, and ought to be used sparingly. Cyclopropane, trilene, and chloroform can cause arrhythmias and are contraindicated. Spinals might cause the patient undue emotional upset, although in failure spinal hypotension might be used as a temporary phlebotomy. A good routine is demerol every 3–4 hours with atropine 1 hour before induction, followed by ether and high oxygen in the second stage.

6. *Respiratory embarrassment*: Whether the causes are bacterial, mechanical or neurological it is unwise to use general anaesthesia. Regional anaesthesia with or without oxygen by mask is definitely indicated.

7. *Caesarean section*: Almost all agents may be used, and none is entirely satisfactory. The ideal anaesthetic would (1) give complete muscular and peritoneal flaccidity, (2) a contracted gastrointestinal tract, (3) provide for minimal respiratory excursions, (4) maintain an irritable uterus and (5) would not depress mother or baby. Gaseous agents require the addition of relaxants which might prove dangerous in an emergency since regurgitation is favoured by a lax cardia. Ether, cyclopropane plus relaxants, and cyclopropane with ether work well; they should be given within ten minutes of induction to avoid foetal depression. At the Royal Victoria Hospital spinal anaesthesia with oxygen until the baby is born, followed by intravenous morphine and demerol works quite well. Other centres prefer epidurals which are quite satisfactory in experienced hands.

Summary

The foregoing discussion has attempted to give a quick summary of the vast field of obstetrical analgesia and anaesthesia. It has illustrated that a great armamentarium is available to the anaesthetist on almost every occasion with only a few situations providing clear cut criteria for his choice. It is obvious that the men involved are much more important than the tools, and that no set of rules can substitute for good judgment.

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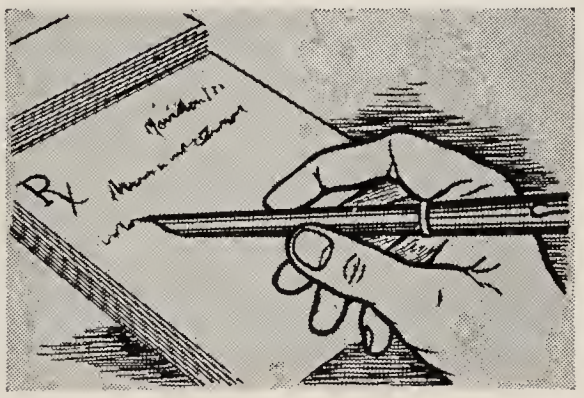

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